

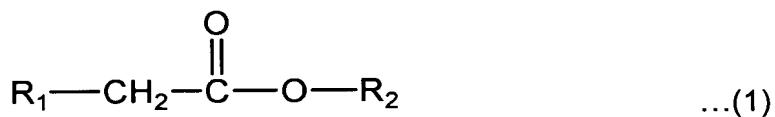
What is claimed is:

1. A non-aqueous electrolytic solution comprising:

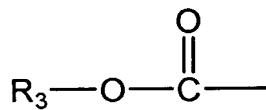
a lithium salt;

an organic solvent; and

5 at least one of compounds having formula (1) below:



where  $\text{R}_1$  is selected from the group consisting of a hydrogen atom, a halogen atom, 10 a hydroxy group, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkoxy group, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-C}_{30}$  aryl group, a substituted or unsubstituted  $\text{C}_6\text{-C}_{30}$  aryloxy group, a substituted or unsubstituted  $\text{C}_2\text{-C}_{30}$  heteroaryl group, a substituted or unsubstituted  $\text{C}_2\text{-C}_{30}$  heteroaryloxy group, and

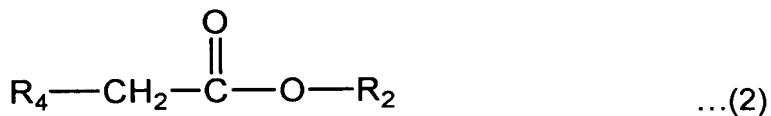


15 where  $\text{R}_3$  is selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-C}_{30}$  aryl group, and a substituted or unsubstituted  $\text{C}_2\text{-C}_{30}$  heteroaryl group;

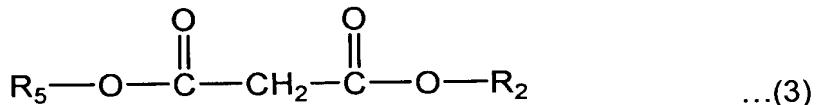
20 and  $\text{R}_2$  is selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-C}_{30}$  aryl group, and a substituted or unsubstituted  $\text{C}_2\text{-C}_{30}$  heteroaryl group.

25 2. The non-aqueous electrolytic solution of claim 1, wherein the at least one of the compounds of said formula (1) is contained in an amount of 0.01-5 parts by weight with respect to 100 parts by weight of the organic solvent.

3. The non-aqueous electrolytic solution of claim 1, wherein the at least one of the compounds of said formula (1) is one of a compound of formula (2) below, a compound of formula (3) below, and a mixture of the forgoing compounds:



where  $\text{R}_4$  is selected from the group consisting of a hydrogen atom, a halogen atom, a hydroxy group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkoxy group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-}\text{C}_{30}$  aryl group, a substituted or unsubstituted  $\text{C}_6\text{-}\text{C}_{30}$  aryloxy group, a substituted or unsubstituted  $\text{C}_2\text{-}\text{C}_{30}$  heteroaryl group, and a substituted or unsubstituted  $\text{C}_2\text{-}\text{C}_{30}$  heteroaryloxy group; and  $\text{R}_2$  is selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-}\text{C}_{30}$  aryl group, and a substituted or unsubstituted  $\text{C}_2\text{-}\text{C}_{30}$  heteroaryl group, and



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where  $\text{R}_5$  is selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-}\text{C}_{30}$  aryl group, and a substituted or unsubstituted  $\text{C}_2\text{-}\text{C}_{30}$  heteroaryl group; and  $\text{R}_2$  is selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkyl group, a substituted or unsubstituted  $\text{C}_1\text{-}\text{C}_{20}$  alkenyl group, a substituted or unsubstituted  $\text{C}_6\text{-}\text{C}_{30}$  aryl group, and a substituted or unsubstituted  $\text{C}_2\text{-}\text{C}_{30}$  heteroaryl group.

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4. The non-aqueous electrolytic solution of claim 3, wherein the compound of said formula (2) is one of dimethyl acetate, methylethyl acetate,

methylbutyl acetate, diethyl acetate, ethylmethyl acetate, ethylbutyl acetate, dibutyl acetate, butylethyl acetate, and butylmethyl acetate.

5. The non-aqueous electrolytic solution of claim 3, wherein the compound of said formula (3) is one of dimethyl malonate, methylethyl malonate, methylbutyl malonate, diethyl malonate, ethylmethyl malonate, ethylbutyl malonate, dibutyl malonate, butylethyl malonate, and butylmethyl malonate.

10. The non-aqueous electrolytic solution of claim 1, wherein the organic solvent is at least one selected from the group consisting of a polyglyme, a dioxolane, a carbonate, 2-fluorobenzene, 3-fluorobenzene, 4-fluorobenzene, dimethoxyethane, and diethoxyethane.

15. The non-aqueous electrolytic solution of claim 6, wherein the polyglyme is at least one selected from the group consisting of diethyleneglycol dimethylether ( $\text{CH}_3(\text{OCH}_2\text{CH}_2)_2\text{OCH}_3$ ), diethyleneglycol diethylether ( $\text{C}_2\text{H}_5(\text{OCH}_2\text{CH}_2)_2\text{OC}_2\text{H}_5$ ), triethyleneglycol dimethylether ( $\text{CH}_3(\text{OCH}_2\text{CH}_2)_3\text{OCH}_3$ ), and triethyleneglycol diethylether ( $\text{C}_2\text{H}_5(\text{OCH}_2\text{CH}_2)_3\text{OC}_2\text{H}_5$ ).

20. The non-aqueous electrolytic solution of claim 6, wherein the dioxolane is at least one selected from the group consisting of 1,3-dioxolane, 4,5-diethyl-dioxolane, 4,5-dimethyl-dioxolane, 4-methyl-1,3-dioxolane, and 4-ethyl-1,3-dioxolane.

25. The non-aqueous electrolytic solution of claim 6, wherein the carbonate is at least one selected from the group consisting of methylene carbonate, ethylene carbonate, diethyl carbonate, dimethyl carbonate,  $\gamma$ -butyrolactone, propylene carbonate, methylethyl carbonate, and vinylene carbonate.

30. The non-aqueous electrolytic solution of claim 1, wherein the concentration of the lithium salt is in a range of 0.5-2.0M.

11. A lithium battery comprising:  
a cathode;

an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 1.

5        12.      The lithium battery of claim 11, wherein the cathode is made of at least one selected from the group consisting of a lithium composite oxide, a simple substance sulfur, kasolite containing dissolved  $Li_2S_n$  where  $n \geq 1$ , organo-sulfur, and a carbon-sulfur composite polymer expressed as  $(C_2S_x)_y$  where  $x$  ranges from 2.5 to 20 and  $y \geq 2$ .

10       13.      The lithium battery of claim 11, wherein the anode is one of a lithium metal electrode, a lithium-metal alloy electrode, and a lithium-inert sulfur composite electrode.

15       14.      A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 2.

20       15.      A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
25       the non-aqueous electrolytic solution of claim 3.

30       16.      A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 4.

17. A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 5.

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18. A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 6.

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19. A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 7.

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20. A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 8.

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25. A lithium battery comprising:  
a cathode;  
an anode;  
a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 9.

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22. A lithium battery comprising:  
a cathode;  
an anode;

a separator interposed between the cathode and the anode; and  
the non-aqueous electrolytic solution of claim 10.